

TWO NEW SPECIES AND SOME NOMENCLATURAL CHANGES IN OENOTHERA SUBG. HARTMANNIA (ONAGRACEAE)

PETER H. RAVEN and DENNIS R. PARNELL

For the past three years, we have been engaged in a detailed systematic investigation of *Oenothera* subg. *Hartmannia*. At this time, it appears desirable to record some of our findings which affect the names in the group so that these names will be available for other publications. This work has been supported by a series of grants from the National Science Foundation, most recently by GB-7879X.

Oenothera platanorum Raven & Parnell, sp. nov. Herba perennis basi pauci- vel multiramosa, radice crassa, 0.5–5.6 dm alta, strigulosa. Folia anguste elliptica vel elliptica, raro anguste ovata, subserrata vel subintegria; folia basalia rosulata, 1–7 cm longa, 4–14 cm lata, interdum sinuato-pinnatifida, subglabria vel strigulosa praesertim ad nervos costamque; folia caulina 1.2–5 cm longa, 3–11 mm lata; petiolum 3–32 mm longum. Inflorescentia erecta. Sepala sub anthesi connata, apicibus sublati ad 1.5 mm longis, 7.5–11.5 mm longa, 1.5–2 mm lata, strigulosa. Petala rosea, 8–14 mm longa, 8–12.5 mm lata. Filamenta 4–9 mm longa; antherae 2.5–3.5 mm longae. Lobi stigmatis 2–4 mm longi. Stylus 12–19 mm longus. Tubus hypanthii 9–14 mm longus, apice 1.5–3 mm diametro, extus strigulosus. Capsula clavata vel anguste obovoidea, 9–14 mm longa, 3–4 mm crassa, 4-angulata, in quoque angulo vulvulaque costa prominente, loculae subdistinctae; pedicellus 4–15 mm longus. Semina dilute brunnea, 0.7–0.9 mm longa, 0.3–0.5 mm crassa, anguste obovoidea vel interdum ovoidea, ad columnam persistentem centralem affixa. Numerus chromosomaticus, **n = 7**.

Type. Texas. Cochise Co: Near Fort Huachuca. Lemmon 2704, May 1846 (F 99335-holotype, F, G, GH, US).

Additional specimens examined. ARIZONA. Cochise Co.: Fort Huachuca, base of Huachuca Mts., Mearns 1527 (US); near Fort Huachuca, Wilcox 190 (US); Bear Creek Huachuca Mts., Goodding 272 (RSA); Garden Canyon, Huachuca Mts., Kearney & Peebles 14070 (GH, US); Huachuca Mts., Holkner 1662 (DS, US), Toumey in 1894 (GH, US); Hereford, Jones in 1947 (POM). Gila Co.: Rio San Carlos, Mohr 269 (US). Pima Co.: Fort Lowell, Tucson, Thornber 457 (DS, MO, US). Pinal Co.: near Sacaton, Harrison 1778 (US). Santa Cruz Co.: Sycamore Canyon, Mason 1685 (MEX); near Canelo, Arnold in 1938 (DS, GH).

This proposed new species is most closely related to the widespread *rosea* L'Hér. ex Ait., to which it is superficially similar. In that species, however, the hypanthial tube is only 5–7 mm long and the petals only 5–8 mm long and 4–6.5 mm wide. More importantly, *O. rosea* is a com-

plex structural heterozygote, the chromosomes forming a ring of 14 at meiotic metaphase I (Raven and Parnell, unpubl.), whereas *O. platanorum*, as determined by an examination of 3 plants grown from the progeny of *Parnell 1031*, from Sycamore Canyon, Santa Cruz Co., Arizona, forms 7 bivalents at meiotic metaphase I. Like other complex structural heterozygotes in Onagraceae, *O. rosea* has only 40–60 per cent stainable pollen, *O. platanorum* normally more than 95 per cent. Although it is at present known only from southern Arizona, *O. platanorum* will doubtless eventually be discovered in adjacent northern Mexico, since it occurs within a few miles of the international border.

Oenothera texensis Raven & Parnell, sp. nov. Herba perennis erecta 2.5–5 dm alta, basi pauci- vel multiramosa, radice crassa, strigulosa sparse hirsutaque. Folia elliptica vel anguste ovata, raro ovata, serrulata vel sinuato-pinnatifida (praesertim basalia), subglabria vel sparse strigulosa praesertim ad nervos costamque, raro dense hirsuta, 2.5–4 cm longa, 8–18 mm lata; petiolum 4–21 mm longa. Inflorescentia erecta. Sepala sub anthesi connata, apicibus subulatis ad 2 mm longis, 15–18 mm longa, 2–4 mm lata, strigulosa. Petala rosea, 12–21 mm longa, 10–20 mm lata. Filamenta 9–13 mm longa; antherae 3.5–6 mm longae. Lobi stigmatus 3.5–6 mm longi. Tubus hypanthii 15–21 mm longus, apice 3–4 mm diametro, extus dense strigulosa. Capsula obovoidea, 8.5–14 mm longa, 3.5–6 mm crassa, valde 4–angulata, in quoque angulo valvulaque costa prominente, loculae subdistinctae; pedicellus 7–12 mm longus. Semina delute brunnea, 0.8–1 mm longa, 0.2–0.3 mm crassa, obovoidea vel ovoidea, ad columnam persistentem centralem affixa. Numerus chromosomalis gameticus, $n = 7$.

Type. Texas. Jeff Davis Co: Upper Limpia Canyon near Mt. Livermore, *Ferris & Duncan 2539* (DS 124606-holotype, MO), July 9–12, 1921.

Additional specimens examined. TEXAS. Jeff Davis Co.: Limpia Canyon, *Nealley 145* (F); Fort Davis, *Young* in 1918 (US); 5 miles n w of McDonald Observatory, *Innes & Moon 1141* (GH, TEX); Davis Mts., *Palmer 34376* (US).

MEXICO. Coahuila. Santa Rosa Mts., *Marsh 1375* (TEX); Sierra del Carmen, Cañon de Sentenela on Hacienda Piedra Blanca, *Wynd & Mueller 513* (MICH, S); Muzquiz, *Marsh 643* (TEX). Sinaloa. Ocurahui, Sierra Surotato, *Gentry 6343* (MICH). Tamulipas. Summit of Cerro Zamora, Sierra de San Carlos, *Bartlett 13750* (MICH); Mesa de Tierra, vicinity of San Jose, *Bartlett 10452* (MICH).

Oenothera texensis differs markedly from both *O. rosea* and *O. platanorum*, its closest relatives, in its much larger flowers. Like *O. platanorum*, it regularly forms seven bivalents at meiotic metaphase I (determined in an examination of four plants from the progeny of *Parnell 1029*, from along stream bed, 6.2 miles north of city limit of Fort Davis,

Jeff Davis Co., Texas); and also like that species, it regularly has 95 per cent or more stainable pollen.

OENOTHERA EPILOBIIFOLIA H.B.K. ssp. EPILOBIIFOLIA, Nov. Gen. & Sp. 6: 92. 1823. *O. multicaulis* R. & P. var. *tarquensis* sensu Munz, Amer. J. Bot. 19: 757. 1932; North Amer. Fl. II. 5: 81. 1965, pro parte; non *O. tarquensis* H.B.K., Nov. Gen. & Sp. 6: 91. 1823.

OENOTHERA EPILOBIIFOLIA ssp. **cuprea** (Schlecht.) Raven & Parnell, comb. nov. *O. cuprea* Schlecht., Linnaea 12: 269. 1838. *O. multicaulis* R. & P. var. *tarquensis* sensu Munz, Amer. J. Bot. 19: 757. 1932; North Amer. Fl. II. 5: 81. 1965, pro parte; non *O. tarquensis* H.B.K., Nov. Gen. & Sp. 6: 91. 1823.

In this subspecies, which is found from central Mexico to Costa Rica and again in southern Colombia, the yellow petals at anthesis have a bright red blotch in the lower third to half; in ssp. *epilobiifolia*, they are entirely yellow. *Oenothera epilobiifolia* ssp. *epilobiifolia* is found in central and northern Colombia and adjacent Venezuela. In both subspecies, the petals fade red after fertilization.

OENOTHERA MULTICAULIS R. & P., Fl. Peruv. 3: 80, t. 317. 1802. *O. tarquensis* H. B. K., Nov. Gen. & Sp. 6: 91. 1823. *O. multicaulis* var. *tarquensis* (H. B. K.) Munz & Johnston, Contr. Gray Herb. 75: 18. 1925.

Our unpublished investigations have shown that this species, in the sense of Munz (Amer. J. Bot. 19: 755–765. 1932), consists of two biological entities. One of these, corresponding largely to his var. *typica*, is a complex structural heterozygote which regularly forms a ring of 14 chromosomes at meiotic metaphase I and is best known from high elevations in Peru and Bolivia. This relatively small-flowered species also ranges north to Ecuador, however, and as shown by a comparison between recent collections from the Río Tarqui (Valley of the Río Tarqui, a few km s. of Cuenca, Giles 43a) and the type of *O. tarquensis* H. B. K. (P), includes that entity. The oldest available name for the larger-flowered, bivalent-forming species in then *O. epilobiifolia*, but it corresponds largely to the entity that has been known as *O. multicaulis* var. *tarquensis* (H. B. K.) Munz & Johnston. Like other complex structural heterozygotes in Onagraceae, *O. multicaulis* forms only 40 to 60 per cent stainable pollen, whereas in *O. epilobiifolia* the plants regularly have 95 per cent or more stainable pollen. A few populations in southern Ecuador and Peru which are evidently not complex structural heterozygotes are currently under investigation.

OENOTHERA KUNTHIANA (Spach) Munz, Am. J. Bot. 19: 759. 1932. *Hartmannia domingensis* Urban & Ekman, Ark. Bot. 23A: 28. 1931. *Oenothera domingensis* (Urban & Ekman) Munz, North Amer. Fl. II. 5: 82. 1965.

An examination of the holotype of *Hartmannia domingensis* (S) has

shown it to be referable to this widely distributed complex structural heterozygote (Raven and Parnell, unpubl.). It has hitherto been compared with *O. rosea*, to which it is only distantly related, and this has led to its continued recognition as a species.

OENOTHERA SPECIOSA Nutt., Jour. Acad. Nat. Sci. Philadelphia 2: 119. 1821. *O. delessertiana* Steud., Nom. Bot. ed. 2. 2: 206. 1841. *O. speciosa* var. *childsi* (Bailey) Munz, Leafl. W. Bot. 2: 87. 1935.

Although populations of this species from north Texas northward are often diploid ($n = 7$), with white flowers that open at sunset, whereas those from central Texas southward and also common in cultivation and occasionally established elsewhere are usually tetraploid ($n = 14$), with rose-purple flowers that open near sunrise, intensive studies in the field have shown that these correlations do not always hold true (Raven and Parnell, unpubl.). It seems best, therefore, to group all of these plants in one species, without subdivision, and to describe the characteristics of particular populations of interest rather than to accord them distinctive Latin names.

SUMMARY

Critical remarks on *Oenothera* subg. *Hartmannia* are presented. Two new species, *O. platanorum* and *O. texensis*, which for bivalents at meiotic metaphase I, are segregated from the complex structural heterozygote, *O. rosea*, which forms a ring of 14 chromosomes at meiotic metaphase I. The pair-forming *O. epilobiifolia* (*O. multicaulis* var. *tarquensis* of most authors) is segregated from the complex structural heterozygote *O. multicaulis*, whereas *O. domingensis* is synonymized with *O. kunthiana* and *O. delessertiana* with *O. speciosa*. With these changes, we currently recognize the following species of subg. *Hartmannia* as valid: *O. seifrizii* Mung, *O. epilobiifolia* HBK., *O. multicaulis* R. & P., *O. tetraptera* Cav., *O. kunthiana* (Spach) Munz, *O. deserticola* (Loesener) Munz, *O. purpusii* Munz, *O. texensis* Raven & Parnell, *O. platanorum* Raven & Parnell, *O. rosea* L'Her. ex Ait., and *O. speciosa* Nutt. All of these species are diploid ($n = 7$) except for the last, in which auto-tetraploids ($n = 14$) occur commonly: and all of the diploids form bivalents at meiotic metaphase I except for *O. kunthiana*, *O. multicaulis*, and *O. rosea*, which are complex structural heterozygotes. *Oenothera speciosa* is self-incompatible, all the others are self-compatible, with varying degree of out crossing.

Department of Biological Sciences, Stanford University
Department of Biological Science, California State College, Hayward